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PROCEDURES FOR COLLECTING AND SUBMITTING SAMPLES TO DETERMINE IF NEMATODES ARE CAUSING PLANT PROBLEMS

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Recognizing Damage Caused By Nematodes

Many times the injury caused by nematodes progresses gradually, until root damage is severe. Injury may often go unnoticed, especially if nematode-free plants are not present for comparison. When root damage becomes severe, one or more aboveground symptoms may occur, such as stunted and unthrifty growth; yellowing and reduction of leaf size; slow wilting or unusual sensitivity to heat and moisture stress; and premature plant senescence. Such symptoms are indicators that a nematode problem may be present and that soil and plants should be analyzed for the kinds and numbers of plant-parasitic nematodes present.

Some plant-parasitic nematodes feed on leaves and stems. In Florida, a foliar nematode frequently occurs on fronds of bird's-nest fern and is sometimes found infecting leaves of other plants. Most nematodes, however, damage plants by feeding on the roots. Root-knot nematodes are most frequently recognized because they cause galls or abnormal swellings of the roots, although many kinds of plant-parasitic nematodes that injure the roots do not cause galls. For example, lesion, lance, or burrowing nematodes often cause lesions (brown spots) on the roots. In time, or with heavy infection, general darkening and discoloration of the roots may occur. Sting, awl, and stubby-root nematodes feed on and stop the growth of root tips. When this happens other roots will sprout near the injured tip, and nematodes subsequently feed on these roots and stop their growth. Such roots then appear tufted or have many short stubby roots that appear to emerge from the same point. Other species of nematodes may simply reduce the overall size of the root system, and this damage is very difficult to detect or observe without laboratory analysis. Plant symptoms which appear very similar to those caused by nematodes may also be caused by fungi, bacteria, viruses, insects, chemicals, nutritional deficiencies or excesses, or adverse environmental effects. Other disease-causing organisms often interact with nematodes and increase the total damage. An accurate diagnosis of many nematode-related problems requires the analysis of other contributing agents.

How To Take An Adequate Sample

Amount of soil and roots needed: Nematodes do not occur uniformly throughout the soil. For this reason, a representative sample should be prepared from a mixture of 5-15 cores of soil, depending on the size of the area sampled. Cores can best be obtained with a soil-sampling tube, but a trowel or shovel may be used to cut a slice of soil, and then a 1-2 inch (3-5 cm) vertical band removed from the slice. A minimum of one pint of soil to a maximum of one quart of soil should be submitted per sample. If more soil is obtained during the sampling process, thoroughly mix the soil from the various cores before selecting the correct amount and placing it in a plastic bag. Be careful not to mix soil from the different species of plants, since the numbers and kinds of nematodes associated with them will likely be different. Therefore, mixing soil from different plant species will make it impossible to accurately interpret the results of the laboratory analysis. An exception to this would be an area such as a small garden where many types of vegetables are being grown, and it is practical only to determine if the entire area needs treatment. In this case only one sample, consisting of many cores but not to exceed one quart, should be submitted. Sampling tools should be cleaned after each sample to prevent contamination of samples, or spread of the nematodes from one area to another. Certain types of nematodes may be found only in the roots; therefore, when possible, one-half pint of roots should be submitted with each soil sample. If collected separately, roots should be placed in the plastic bag and should be covered with soil collected from the root zone to prevent the roots from drying or overheating. For the best results, avoid taking samples when the soil is excessively dry or wet. But even if the soil seems dry, do not add water to the sample.

Where to sample: Soil and roots should come from root zones of plants showing decline or at the outer margin of an affected area. Sampling from dead plants gives very limited information for diagnostic purposes. If the diseased area is well defined, then declining plants on the border between healthy and severely diseased plants should be sampled. It may be helpful to submit an additional

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sample from the healthy area to compare the number of nematodes from this area with the number of nematodes found in the infested area.

Sampling depth: A general rule is that sampling depth should be consistent with the root zone of the host plant. Turf and forage crops should be sampled to a depth of 3-4 inches (8-10 cm), and annual crops such as vegetables, annual ornamentals, and field crops, should be sampled to a depth of 6-8 inches (15-50 cm). Trees and perennial ornamentals should be sampled near the drip-line (near outer edge of foliage) at the depth where roots are abundant. It is best to collect live feeder roots and the soil around them. A shovel or spade may be used to find live feeder roots. The first several inches of surface soil beneath trees and shrubs usually contains the roots of weeds and grasses and very few feeder roots. This soil may usually be disregarded.

Labeling and protecting samples: To facilitate handling and prevent drying of the roots and soil, a sample should be placed in a strong plastic bag, and not in a paper bag or similar container. The plastic bag should be secured with a rubber band or twist-tie. It is important that a sample number and the collector's name be written near the base of each bag with a permanent black felt-tip marker, or on a label outside the bag. Be sure this number agrees with the number used in the corresponding background information sent on a separate sheet. Do not put any information on paper tags inside the bag, since the information usually becomes illegible before the sample arrives at the laboratory. Once the bag is closed, avoid exposing it to direct sunlight or storing it in the trunk or cab of a truck where it can easily become overheated. Soil in a plastic bag that is exposed to sunlight may reach temperatures that are lethal to nematodes in less than half an hour.

Check-List Of Information That Should Be Sent For Each Sample

In addition to writing the collector's name and sample number on the plastic bag containing the sample, the following background information should be submitted on a separate sheet. Any variation in the information pertaining to the different samples should be clearly indicated.

- ☐ NAME: Owner's and/or collector's name.
- ☐ TELEPHONE: Telephone number and name of person familiar with plant problem.
- ☐ ADDRESS: Supply names and mailing address of all person(s) to whom results are to be sent. (Mailing address of DPI employes need not be given.)
- ☐ LOCATION: Nearest town or city to collection site.
- ☐ DATE: Sample collection date.
- ☐ HOST: Scientific and/or the common name, and if known, the cultivar or variety name of the plant sampled.
- ☐ SYMPTOMS: Describe any abnormal characteristics of plants with problems and indicate approximately when symptoms were first observed.
- ☐ AFFECTED PLANTS/TOTAL: Area or number of affected plants compared to number of healthy plants of same species. Examples: 10 plants affected/20 total; or 1 acre affected/3 total.
- ☐ PURPOSE: Indicate whether sample is from a commercial nursery, field, grove, golf course, lawn, garden, or household plant. This information is essential because control options and regulations for nematicide treatment are different for home and commercial use.

Additional Information That Should Be Submitted If Applicable

1. If many plants are present, describe the pattern of distribution of abnormal plants, i.e., scattered plants, groups of plants, or almost all plants in the field.

2. Give the kind, rate, and date when chemicals were applied in recent months; this includes fertilizers, lime (indicate if hydrated builder's lime or dolomite limestone), nematicides, fungicides, insecticides, and herbicides.

3. List any other influences to which only the diseased plants were exposed. Examples of factors to be considered: drainage from a building, former building sites; low areas with poor drainage, plants previously grown at the site sampled, chemical treatment, and exposure to the sun.

In conclusion, the steps of carefully observing a plant problem, collecting and labeling samples, supplying complete background information, and laboratory processing of samples, are interdependent links in a chain. Failure at any one step will limit the accuracy of diagnosis and control recommendation.